Science Students in Scientists Shoes

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The purpose of any curriculum is to develop the ability to think. We have many Curricula at various stages of education, but have we achieved the above is a mute question, that has never been answered.

The sciences, being the gate way of development need a thorough revision of the curricula, so as to make it more dynamic and forward looking. In fact the principles of curriculum construction in science have not been looked into at all, but curriculum development has been degraded to syllabus revision. The syllabus revision is nothing but addition of few topics or deletion of a few topics. In the university level, this is worse, because a professor writes down a few topics under a title and gets it passed in Board of Studies, Faculty and Academic Council, etc. Hence, we should aim at curriculum development in science, than syllabus revision. The science curriculum at school/college stage must be process oriented as that is the very nature of science. The important process skills are observation, classification, measuring, using numbers, interpretation, finding time-space relationships, formulating hypotheses, controlling variables, predicting, inferring, communicating, designing experiments and experimenting.

The investigatory projects must become an integral part of science curricula. Each problem must be posed and solved by the students. The information could be got in the TV, libraries, internet, etc., but processing that information is very much important at this stage. Many of us must accept ‘we do not know’ or at least let us act in that fashion, to trigger the thinking of our students.

The science students must get into the shoes of the scientists and learn the process of science. We can take up an example in detail. A student of mine asked me as to what would happen to the density of seeds, when we soak them in water. I sent them to the library to search for the answer, they came back with no answer. I sent them to a neighboring first grade college to ask the Botany Professors. Even there, the students could not get the answer. In those days, internet had not become popular.

Then we came to the 3rd stage, viz, project stage. Here I asked the students to pose the problem. After some modifications the students arrived at the problem as "Effect of duration of soaking on the density of seeds". The students were encouraged to find out the dependent variable (density) and independent variable (duration of soaking). I intervened and said that there are also intervening variables, which affect the density. The students listed them as Room Temperature, Temperature of water, Volume of the vessel, Quantity of water, Pressure, Types of water, Types of seeds, Quality of seeds, etc.

The students decided that they would work with hard water and soft water. They also decided to work with Chana, Kabul Chana, Green Gram and Cow Peas. All the students were grouped in twos and the work was distributed. Before they started the experiment, they had the difficulty of how to find the volume, and density. They decided upon 10 seeds instead of one. They also came up with an idea that they would take a 'Zero' reading before they immersed the seeds in water for 30 minutes.

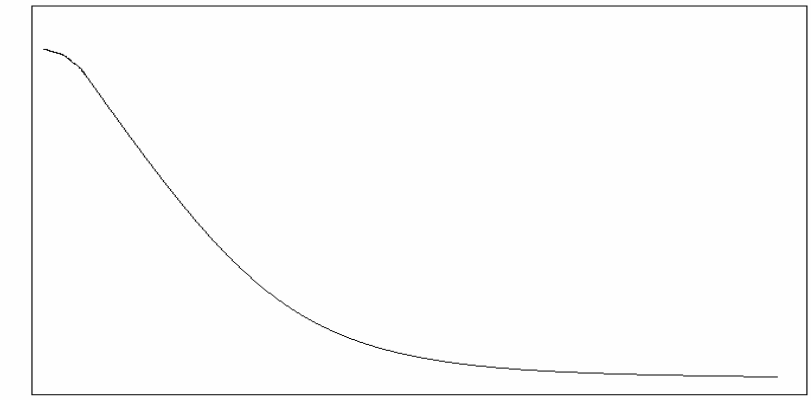
The students controlled the variables like Quantity, Quality, etc. They decided on a 500ml beaker with 250cc of water for all groups. All the experiments would be done in one room only wherever it is, viz, I or II or III floor. They would not do one experiment in a normal room and other in an air-conditioned room. To decide the quality of seeds, I had to intervene and say that one morsel taken from one gunny bag would have the same quality, supposed to be from the same plot. (This would be an assumption, like all scientists have some assumptions).

The students took the zero reading by weighing the seeds (M) and finding the volume (V) of seeds by immersing them in a measuring jar with particular amount of water. The difference in levels was taken to be the volume of the seeds. They immersed the seeds for 30 minutes, took out the seeds, removed the water droplets by a filter paper and found out the density. This they repeated for 60 minutes, 90 minutes and 120 minutes.

The black boar in my class room was full of densities entered by students in the cells appropriate to their group.

	0	30	60	90	120
Chana					
Kabul Chana					
Green Gram					
Cow Peas					

Then I asked the students what can be done now and how to interpret this table. One of the students said that they could develop a graph. I agreed for the same. The graph looked some what like this.



The density decreased fast immediately, but slowed down later but never touched zero. The graph at the bottom was parallel to X axis, which meant that density can never be zero.

The question that arises here is who found out this graph? And who found out this relationship? The B.Ed. students (science) of my college of a particular batch. In fact, many new questions are still unanswered. Therefore, we can say the science is never fully answered. Each student had a sense of fulfillment and wanted to do more. This and many more projects have been tried out in my college, D.Ed. colleges and other Colleges. Why not give it a try in our curriculum?